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ABSTRACT

A comprehensive model of the process of organizational innovation was developed by casting a sequential, five-stage model of the process against five broad sets of factors previously found to influence organizational innovation. Using the model, the relative importance of each set of factors within and across each stage of the process was assessed. The model was found to have high explanatory power; at the same time, areas badly in need of further research were identified. It is suggested that use of this model in future research would facilitate synthesis of knowledge about the process of organizational change. (Author)

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A MODEL OF ORGANIZATIONAL INNOVATION IN AMERICAN ELEMENTARY SCHOOLS

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THE PROBLEM

We have observed in the literature two basic approaches to the study of organizational change. The first approach has been concerned primarily with the conceptualization of organizational change and innovation as a process, and basically derives from an applied management point of view. Writers working from this approach have directed their efforts mainly to: (a) defining the nature and/or content of a series of stages through which an organization could, should, or must pass if it is to successfully change or innovate; and (b) discussions of the actions organizational management should take to facilitate the process. The second approach has focused on identifying the correlates of, or factors influencing, organizational change and innovation, and has derived its impetus more from general theoretical concerns than from an applied management point of view. Writers working from this approach, however, have tended to deal with "organizational change" as a rather ill-defined, amorphous concept. Unfortunately, these two approaches to the study of organizational change and innovation have not been integrated with each other. As a result, we currently have a rather poorly developed theory of organizational change that does not provide a coherent framework for guiding systematic empirical research to help develop a more thorough understanding of the phenomenon.

The purpose of this study is to develop a model of the process of organizational change that integrates the two approaches discussed above. First, we will adapt a sequential multi-stage model of the process of organizational change from the literature representing the first approach. Second, we will identify several sets of factors that have been found to correlate with, or influence, organizational change in the literature representing the second approach. We will then construct an initial model of organizational change that poses a series

of hypotheses by arraying all sets of "influencing factors" against each of the stages in the change process, the hypotheses being that each set of influencing factors is relevant at each stage of the change model. We will test these hypotheses using data collected in two national surveys of elementary schools conducted during the 1972-1973 school year regarding their adoption and use of an educational innovation called "The Electric Company."

THE CONCEPTUAL MODEL

We begin by briefly discussing extant models of organizational change and presenting what we consider the most comprehensive model currently explicated. Second, we discuss six broad categories of factors that are presumed to have some impact on the process of organizational change. Third, we present a conceptual model of organizational change that integrates stages in the change process with the categories of factors thought to influence the process at each stage.

A Model of Organizational Change

There have been several presentations in the literature of models of the process of organizational change (cf. Lewin, 1958; Mann and Neff, 1961; Guest, 1962; Hage and Aiken, 1970; Kaplan, 1971; Gross et al., and Giacquinta, 1973). While there is a considerable amount of overlap, both in terms of stages in the process and in the content of the stages, the model developed by Kaplan (1971) is the most comprehensive of the group and is well suited to our needs.

In keeping with the concept of change as a process Kaplan presents a seven-stage model of organizational "changing" rather than organizational "change." In reviewing Kaplan's model as presented below it is important to keep in mind a major difference in the primary purpose of this study and the one that led to the development of Kaplan's model. His model may be perceived as describing seven stages through which an organization must successively pass if it is ultimately to be successful in establishing an innovation and its concomitant changes. Kaplan's primary emphasis was upon the activities necessary for "management" to accomplish at each stage of the change process in order to achieve the desired organizational objectives(s).

In the present study we accept as an hypothesis the seven stages of Kaplan's model. We wish to examine the effects of each of six broad categories of factors on the degree to which an organization is successful at each stage in the process. In addition, we wish to examine the need for an organization to successfully pass through each stage to accomplish a change objective.

With these considerations in mind we now turn to a brief discussion of each of the seven stages in Kaplan's model of organizational change (adapted from Kaplan, p. 12).

Stage 1: State of the Organization

The first stage in Kaplan's model of the process of organizational change is characterized by the existence of critical conditions within the organization which need changing. In this stage the management of the organization should be continuously assessing the degree of fit between organizational goals and organizational accomplishments.

As an example, an elementary school may have a large proportion of pupils who read below grade level. If a goal of the school is to teach all its pupils to read adequately and "management" is aware that the school is not having a great deal of success in imparting adequate reading skills to its pupils we may identify the school as being in Stage 1 -- there is a substantial lack of fit between an organizational goal and the organization's accomplishments in that area, thus defining the existence of a problem condition within the organization that needs to be changed.

Stage 2: Diagnosis

In the second stage of the change process problems should be analyzed, alternatives identified and compared, and a corrective course of action prescribed. This indicates that management should be assessing innovative ideas in the field, seeking extra-organizational inputs, and developing consensus among the organizational decision makers.

In the case of our hypothetical elementary school described in Stage 1 we might find a scenario that goes something like this: The principal and teachers are aware that many of their pupils are not acquiring adequate reading skills. Their analysis of the problem leads tham to the conclusion that the children simply are not being "reached" by traditional teaching methods. They then consider various alternative methods of teaching reading (e.g., help from older students, peer help, a new programmed text, an ITV show designed to teach basic reading skills to hard-to-reach children), and decide to try an ITV approach to alleviating the problem (e.g., "The Electric Company").

Stage 3: Initiation

The third stage in the change process consists of steps being taken by organizational management to facilitate the implementation of the alternative selected in Stage 2. Management should lay the ground-work for the proposed change through measures such as reallocation of existing resources, obtaining additional resources if needed, consulting with experts in the problem area, etc.

In the case of our hypothetical elementary school which opted to use an ITV approach, Stage 3 activities might include having existing TV sets repaired, obtaining additional TV sets, consulting with reading specialists, making special scheduling arrangements to meet the broadcast schedule for "The Electric Company," etc.

Stage 4: Introduction

During the fourth stage there should be an organization-wide dissemination of information about the imminent change. Management sees that details of the change -- including reasons for it and benefits to be derived from it -- are clearly explained to all personnel who will be affected by it in order to secure a high level of awareness (and hopefully, cooperation).

Returning to our hypothetical elementary school, introductory activities that might be undertaken are in-service training sessions to acquaint teachers with "The Electric Company," subscribing to the program guide prepared by the Children's Television Workshop, etc. On the other hand, much communication among teachers and educational administrators takes place informally during coffee breaks in the teachers' lounges. It is therefore quite possible that an effective organization-wide dissemination of information about the adoption and use of an innovation such as "The Electric Company" could be accomplished without using the formal mechanisms suggested above, and would not show up in the data we have collected.

Part of the difficulty in dealing with Stage 4 is inherent in attempting to develop a general model of organizational changing that is applicable to all types of complex organizations. Kaplan's model is predicated on the assumption of a complex organization that has a relatively well-defined hierarchy of authority. Our experience is that teachers in most public schools have a great deal of autonomy over what they do in their classrooms. It would be a very rare circumstance when an elementary school principal would dictate to his teachers that they must, or must not, use a particular teaching technique or aid (such as "The Electric Company").

This is not meant to imply that there is no hierarchy of authority or power within schools or school systems. The extent to which such power or authority would be exercised in relation to the use of an educational innovation is, however, probably directly proportional to the seriousness of the organizational ramifications of adopting the innovation. This point will be discussed further in a subsequent section dealing with the attributes of the innovation being considered for adoption by an organization.

Stage 5: Transition

In the fifth stage of the change process the first moves are made toward incorporation of the changed procedures. Management should keep close contact with the activities of organizational members to make certain that the change directives are being followed. A high rate of adoption of the new procedures by organizational members is sought.

In terms of our hypothetical elementary school, the desired organizational state is that as many as possible of the relevant teachers in the school try out the new teaching technique in their classrooms as soon after its introduction as possible. "Management" should be keeping tabs on the process to help resolve problems as they arise.

Stage 6: Routinization

In this stage, participation in the changed procedures should be widespread and routine among the members of the organization. Management should keep a close surveillance of the results of the changed activities in order to take actions to alleviate difficulties that might arise.

We note that within our hypothetical elementary school the distinction between Stage 5 (the transition among teachers in the school from using the old teaching mode to using the new teaching mode) and Stage 6 (the point at which use of the new teaching mode is routine and widespread) may be somewhat blurred operationally, if not conceptually. Conceptually, the primary distinction between Transition and Routinization is whether members of the organization are "trying out" the changed procedure (Transition State), or are using it on a routine basis as part of their daily activities (Routinization Stage).

Stage 7: Stabilization

The process of organizational change relative to a given innovation, is complete when the changed procedures have become institutionalized in the organization. Management should be periodically assessing the degree of fit between changed organizational goals or procedures and the job-related goals of organizational members in order to minimize social pressure to revert to old patterns.

This completes the description of Kaplan's seven-stage model of organizational change. We have noted some potential conceptual difficulties in applying the model directly to the process of change in educational organizations such as elementary schools. It remains to be seen whether these problems are more apparent than real. As the need arises we shall address them within a broader context as we proceed. We turn now to a discussion of factors that have been found to affect the process of organizational change in some way.

Factors Influencing the Process of Organizational Change[2]

Six broad categories of analytical/conceptual factors that have been found in previous research to affect the process of organizational change can be identified:

[2]The author gratefully acknowledges his debt in this section to the work done by Giacquinta (1973) in his review of the literature that identified the first four categories discussed.

1) The attributes of the innovation being introduced into the organization;
2) The strategies used to introduce the innovation/ change;
3) The characteristics of members of the organization;
4) The characteristics of the organization;
5) The characteristics of the environment in which the organization exists; and
6) The characteristics of the organizational throughput.

Most of the empirical studies of organizational change have either (1) ignored the stages in the process, treating organizational change as an ill-defined, amorphous entity; or (2) those works that have conceptualized the process as a series of stages have been primarily concerned with the strategies most appropriately employed at each stage by management to maximiae the probability of successfully installing the innovation. The result is that there has been little exploration of the potentially differential roles the six broad categories of factors listed above may play at different stages in the process. Such an exploration constitutes one of the primary thrusts of the present study, although we do not have the data to examine all six categories.

Attributes of Innovations

Several discussions of the attributes of innovations have been presented in the literature (Miles, 1964; Katy et al., 1963; Leavitt, 1965; Miller, 1967). There is a good deal of conceptual similarity among each of these four discussions of attributes of innovations. The Miles, Katz and Miller discussions all appear to be predicated on the same basic assumption -- that the most useful basis for classifying innovations is in terms of the degree of pervasiveness implied in their adoption (i.e., how much disruption or change is implicit in adoption of an innovation), with the concomitant assumption that the more pervasive the change implied by adoption or an innovation the less likely it will be successfully adopted and retained.

The Leavitt paradigm poses a more focused organizational perspective, assuming that the most useful basis for classifying innovations is the aspect of a complex organization most directly affected by the adoption of an innovation. At a more subtle level, however, even this perspective implies an emphasis on the degree of organizational disruption involved in the adoption of an innovation.[3]

From the perspective of organizational change, the attributes of an innovation most salient for the process of organizational change must, in large part, be defined in terms relative to the organization adopting the innovation. The "same" innovation (e.g., "The Electric Company") has differing meanings and implications for organizations with dissimilar characteristics. In other words, we expect organizations with different characteristics to perceive differentially and respond in different ways to the same innovation. This constitutes the most fundamental working hypothesis underlying this study.

Strategies of Introduction

As Giacquinta (1973, p. 183) points out, "The greatest concentration of articles on change in schools focuses on strategies of change. Articles advocating specific tactics 'sure to bring about' change or reporting change attempts according to these strategies are plentiful." This is true to the extent that it is virtually impossible to find studies in the area that qualify as valid research comparing the results of different strategies in such a way as to allow drawing meaningful conclusions. Perhaps the overriding contention to be found in the literature concerning strategies to be

[3]The above discussions of attributes of innovations and their effects on adoption and the process of organizational change clearly point to a major area badly in need of conceptual and empirical work -- the development of a taxonomy of attributes of organizational innovations. This undertaking is, however, beyond the purpose and scope of the present study.

employed in accomplishing organizational change is that participation of lower level organizational members greatly contributes to the probability of successful change (Lewin, 1952; Coch and French, 1948; French et al., 1960; Grenier, 1967; Benne and Birnbaum, 1960; Dufay, 1966; Oliver, 1965; Trump, 1967; Dentler, 1964, Byerly and Rankin, 1967; Katz et al., 1950; Lippitt and White, 1952; Worthy, 1950; Morse and Reimer, 1956). Most of these works, however, are subject to criticism so severe on conceptual and methodological grounds that Leavitt (1965, p. 1167) noted that studies investigating the effect of participation of lower-level organization members in the change process are ". . . insufficiently supported by empirical data. The issue of validity remains a critical and difficult issue. When empirical studies have been undertaken to evaluate outcomes, the results have been equivocal at best."

Unfortunately the present study does not provide an opportunity to investigate the effects of lower-level participation and other variations in strategies of introducing an innovation into elementary schools.

Characteristics of Organizational Members

While the heading of this section provides a convenient device for organizing our discussion and making the distinction between organizational characteristics that are in some way a function of the members of the organization and those which are independent of them, it should be kept in mind that in the present study we are dealing conceptually at an organizational level of analysis and not at the individual level of analysis. Thus, while we will discuss characteristics of teachers these will be aggregated and dealt with conceptually as being characteristics of the organizations of which the individuals are members. When we discuss the characteristics of school principals (a case in which aggregation does not occur) they will be conceptualized as characteristics of the boundary-spanning and management roles of the organization.

It appears that much of the work done related to the effects of the personal characteristics of organizational members on the process of organizational change stems from work done by Rogers on the diffusion of innovations among individuals. Rogers (1965, pp. 58-59) concludes that:

(a) Innovators are generally young.

(b) Innovators have relatively high social status, in terms of amount of education, prestige ratings, and income.

(c) Impersonal and cosmopolite sources of information are important to innovators.

(d) Innovators are cosmopolite (travel widely and participate in affairs beyond the limit of their system).

(e) Innovators exert opinion leadership.

(f) Innovators are likely to be viewed as deviants by their peers and by themselves.

The extension of these characteristics has generally been to boundary-spanning personnel of organizations (Riley and Riley, 1962; Menzel, 1960; Berelson and Steiner, 1964). Corwin (1972) found characteristics of boundary-spanning personnel to be highly correlated with the degree of innovativeness (in a technological direction) of schools, with the characteristics of the rank-and-file personnel having little correlation.

Demeter (1951) identified school principals as key figures in the innovative process, their sympathy or hostility toward an innovation strongly affecting the probability of its adoption, but he does not discuss related personal characteristics. Carlson (1964) found that several characteristics of system superintendents which basically describe their position in a social network are correlated with the point in the diffusion process of an innovation at which the system adopts the innovation. These characteristics included professionalism, prestige, amount of education, and degree of involvement in the social network.

Characteristics of Organizations

Probably the primary theoretical work addressed to the question of the effects of structural properties of organizations on the process of organizational change is the volume by Hage and Aiken (1970). They defined four structural properties of complex organizations and developed four basic hypotheses about how each of these properties relates to the propensity of an organization to undergo program change (innovate):

(a) The greater the complexity, the greater the rate of program change. Complexity refers to the level of knowledge and expertise in an organization in terms of the number of occupational specialties and the degree of professionalism of each.

(b) The higher the centralization, the lower the rate of program change. Centralization refers to the degree to which decision-making power resides in the hands of a few.

(c) The greater the formalization, the lower the rate of program change. Formalization refers to the number of, and strictness with which, rules specifying what is to be done are enforced.

(d) The greater the stratification, the lower the rate of program change. Stratification refers to the differential allocation of rewards to the jobs in an organization. The greater the difference between the top and the bottom, the greater the degree of stratification in the organization.

Giacquinta (1973) has argued that while Hage and Aiken have cited several studies to support their rationale for these hypotheses, they are far from proven and many logically allow for opposite predictions. While this is undoubtedly true, the work of Hage and Aiken in this area provides excellent leads for further empirical investigation.

Lippitt et al. (1967) have argued that the structure and arrangements of the school building are associated with the process of innovation and diffusion of classroom practices, this being related to the degree to which communication among teachers is facilitated. This would lead us to expect that schools which employ team teaching, for instance, would have a tendency to innovate to a fairly great extent in other areas as well.

This point tends to lead us to a consideration of the mechanistic-organic model of organizations proposed by Burns and Stalker (1961), and the general hypothesis of organizations with a "climate of innovativeness" it imples. If schools which have installed innovative practices in one area tend to innovate in additional areas, we would expect schools which are currently engaged in several innovative practices to be more likely to be more successful and complete users of the innovation being used as the dependent variable in this study as well.

Organizational Environment

Schools, as other complex organizations, may be seen as open social systems and are, therefore, subject to environmental impingements to some degree. Sieber (1968) argues that schools are particularly vulnerable to the whims of the environments in which they are located. Gittell and Hollander (1968), on the other hand, found in their study of six urban school districts that most of them quite successfully protected their organizational boundaries from being penetrated by environmental forces. They also found that those school systems most vulnerable to environmental pressures were most innovative. The basic point is, that while schools in general may be more vulnerable to environmental impingements than many other types of complex organizations, schools may differ radically among themselves in the degree to which they maintain the integrity of their organizational boundaries. Thus, while several authors (Litwak and Hylton, 1962; Wayland, 1964; Clark, 1965; Evan and Black, 1967) have

indicated that organizations located in modern, changing environemnts will tend to be more innovative, this relationship must be considered to be conditional upon the degree to which the organization can protect itself from environmental impingements.

In addition to considerations of the degree to which an organization is vulnerable to environmental impingements, the nature of the environment should be taken into consideration. Agger and Goldstein (1971) argue that there is a general tendency on the part of the public to favor educational innovation in public schools. Yet one does not have to go far to imagine different types of publics that would have considerably different attitudes toward innovative educational practices in the schools which their children attend. That is simply to argue that the environments of different schools may range from openly hostile toward innovative practices to overtly supportive.

We turn now to a brief discussion of the last of the six broad categories of factors that are thought to be potential influences on the process of organizational change.

Characteristics of Organizational Throughput

Herriott and Hodgkins (1973) in their volume, The Environment of Schooling: Formal Education as an Open Social System, differentiate between the input and throughput of schools. Input is defined as ". . . that energy (materials or personnel) or meaning (information) that is imported by a sociocultural system in order to sustain and perpetuate itself over time" (pp. 78-79). They then go on to define throughput:

> Throughput and Output. Given the distinction noted above, material, personnel, or information acted upon by the system in performing its institutional role need not be thought of as input. Rather, essential materials used in the manufacturing of a product, patients entering a hospital, or customers in a service organization, or information used in a public relations firm, are all examples of throughput. Necessary for the system, given its social direction, throughput is the focus of system energies, consistent with its structural characteristics and the constraints of the environment of which it is a part (p. 79).

In the case of schools, pupils clearly constitute organizational throughput according to this definition. From an organizational point of view pupils are not members of the organization, even though they are in the organization. It is anticipated, however, that the characteristics of the student body of a school, as organizational throughput providing the focus of the organization's energies, will be a factor influencing the process of organizational change.

In the next section we present a conceptual model that interrelates the six categories of factors and the stages in Kaplan's model of organizational change. This model also sets forth the working hypothesis that will guide the data analysis.

The Full Conceptual Model

In the remainder of this paper we shall address this problem by assessing the influence of the categories of influencing factors on the results of the stages in the proposed model of organizational change. In addition, since Kaplan's model hypothesizes that in order to successfully institutionalize (install) an innovation an organization should successively pass through each stage in the model, we shall include in the vector of influencing factors considered at each stage in the process the results of each prior stage. The general nature of this conceptual model (and analytic approach) is simply depicted by casting it into a matrix of stages of Kaplan's model by categories of influencing factors, as shown in Table 1 on the following page.

Table 1 Matrix Depicting The Full Conceptual Model of Interrelationships Among the Stages of Kaplan's Model of Organizational Change and Six Sets of Influencing Factors

STAGES IN KAPLAN'S MODEL OF THE PROCESS OF ORGANIZATIONAL CHANGE	INFLUENCING FACTORS											
	ATTRIBUTES OF THE INNOVATION	STRATEGIES OF INTRODUCTION	CHARACTERISTICS OF ORGANIZATION MEMBERS	STRUCTURAL PROPERTIES OF ORGANIZATION	CHARACTERISTICS OF ORGANIZATIONAL ENVIRONMENT	CHARACTERISTICS OF THROUGHPUT (PUPILS)	RESULTS OF STAGE 1	RESULTS OF STAGE 2	RESULTS OF STAGE 3	RESULTS OF STAGE 4	RESULTS OF STAGE 5	RESULTS OF STAGE 6
STAGE 1 Existence of a Problem Condition			●	●	●	●						
STAGE 2 Diagnosis	●	●	●	●	●	●	●					
STAGE 3 Initiation	●	●	●	●	●	●	●	●				
STAGE 4 Introduction	●	●	●	●	●	●	●	●	●			
STAGE 5 Transition	●	●	●	●	●	●	●	●	●	●		
STAGE 6 Routinization	●	●	●	●	●	●	●	●	●	●	●	
STAGE 7 Stabilization	●	●	●	●	●	●	●	●	●	●	●	●

Key: ● indicates influencing factor is appropriate for inclusion in analysis of the stage of the model represented by the row.

Each row of the matrix represents a stage in Kaplan's model of the process of organizational change. Each column of the matrix represents either (a) one of the six broad categories of influencing factors, or (b) the results of one of the stages in the model. The bullets in the cells consituting any given row indicate which of the categories of factors and/or results of prior stages in Kaplan's change model should be included in an analysis of the determinants of the results of the stage of the model specified by the row. The presence or absence of bullets in each cell of the matrix therefore implies a set of working hypotheses regarding the interrelationships among the stages in Kaplan's model of organizational change and the six categories of factors.

Limitations on the Conceptual Scope of the Study

In an ideal study of the process of organizational change we would be able to test all of the hypotheses implied by the matrix of stages by influencing factors presented in Table 1. Due to limitations in the available data base, however, we cannot accomplish this goal in the present study. The constraints of the available data impose the following limitations on the conceptual scope of this study:

- We are unable to examine any of the cells in the first column of the matrix. Since we are dealing with a single educational innovation, "The Electric Company," the attributes of the innovation are constant as discussed earlier.

  To be able to examine the effects of the differing attributes of innovations on the process of organizational change would require data from the same organization on several dissimilar innovations.

- We are unable to examine any of the cells in the second column of the matrix. Unfortunately there are no data available to this study related to the strategies employed by organizational management to introduce the innovation.

- We are not able to make a clear operational distinction between Kaplan's Stage 5 (Transition) and Stage 6 (Routinization) because the data available for this study are not truly longitudinal. Therefore we will collapse Stage 5 and Stage 6 and examine the extent to which "The Electric Company" was being viewed within a school at the time the data were collected as the measure of the "extent of adoption" stage.

- We cannot examine any of the cells in the bottom row of the matrix (Stage 7: Stabilisation). The time frame for the study in relation to the time frame for the broadcast of "The Electric Company" leads us to believe that all of our data were collected before any elementary school could have reached the final stage in the process of organizational change relative to the adoption of "The Electric Company."

These limitations effectively reduce the scope of the full conceptual model as presented in Table 1 and result in a restricted model (and associated hypotheses) for analysis in this study. Table 2 on the following page depicts the (restricted) conceptual model of organizational change, sets of influencing factors, and the associated hypotheses regarding the interrelationships between the two, that will be addressed in the remainder of this study.

In the analysis section of this paper we cast the results of our statistical analysis into the same type of matrix. In this case the bullets will be replaced with the proportion of unique variance in each stage accounted for by each set of influencing factors. The matrix will be elaborated further to display the unique proportion of variance in each stage accounted for by the individual factors within each set. Comparison across columns (within rows) will then provide a basis for assessing the unique impact of each of the influencing factors on the results of each stage in the model of organizational change. Comparison across rows (within columns) will provide an assessment of changes in the degree of influence a given factor has on the results of different stages in the model of organizational change.

Table 2 Matrix Depicting the Restricted Conceptual Model of Interrelationships Among the First Five Stages of Kaplan's Model of Organizational Change and the Four Sets of Influencing Factors Addressed in this Study

STAGES IN KAPLAN'S MODEL OF THE PROCESS OF ORGANIZATIONAL CHANGE	INFLUENCING FACTORS							
	CHARACTERISTICS OF ORGANIZATION MEMBERS	STRUCTURAL PROPERTIES OF ORGANIZATION	CHARACTERISTICS OF ORGANIZATIONAL ENVIRONMENT	CHARACTERISTICS OF THROUGHPUT (PUPILS)	RESULTS OF STAGE 1	RESULTS OF STAGE 2	RESULTS OF STAGE 3	RESULTS OF STAGE 4
STAGE 1: Existence of a Problem Condition	●	●	●	●				
STAGE 2: Diagnosis	●	●	●	●	●			
STAGE 3: Initiation	●	●	●	●	●	●		
STAGE 4: Introduction	●	●	●	●	●	●	●	
STAGE 5: Extent of Adoption	●	●	●	●	●	●	●	●

Key: ● indicates influencing factor is appropriate for inclusion in analysis of the stage of the model represented by the row.

METHODOLOGY

In early fall of 1971, shortly before the first broadcast season of "The Electric Company" began, the Children's Television Workshop commissioned a national survey (under the direction of Dr. Robert E. Herriott, Director of the Center for the Study of Education, Institute for a national survey (under the direction of Dr. Robert E. Herriott, Director of the Center for the Study of Education, Institute for Social Research at Florida State University, in conjunction with the Research Triangle Institute) to assess the level of in-school utilization of TEC during its first few months of broadcast (see Herriott and Liebert, 1972). Subsequently, during the summer of 1972, the Children's Television Workshop decided to commission a similar study to be executed during the 1972-1973 school year, the second year of TEC's broadcast schedule.

The data upon which this study is based comes partially from the 1972-1973 in-school utilization study (conducted under the direction of Dr. Roland Liebert, Center for the Study of Education, Institute for Social Research at Florida State University, in conjunction with the Research Triangle Institute) and a survey of the same national sample of schools conducted under the direction of Richard L. Bale. Both of these surveys were conducted during the period from December 1972 through February 1973.

THE SAMPLE SURVEY DESIGN

The population from which the sample was drawn was defined as all public and private schools in the fifty states which were listed by the U.S. Office of Education in 1971, and which contained at least one of grades two, three, or four. This criterion was applied because the target population for TEC was defined as populs below grade level in reading ability in grades two, three, and four.

The actual sampling process proceeded in two phases:

Sampling Design: Phase I

Using computer accessible lists of public and private schools in the United States and its possessions, as complete as possible a list of only those schools in the nation containing at least one of grades two, three, or four was created. A stratified random sample of 15,125 schools was then drawn from this population.

Survey Operations: Phase I

Phase I of the survey was conducted to identify four different categories of schools based on their history of viewing TEC. Table 3 depicts the classification scheme that was generated for this purpose by cross-classifying schools on the basis of whether or not they had used TEC during its first year of broadcast (1971-1972) and whether or not they had used TEC during its second year of broadcast (1972-1973). The result is a four-cell table representing four categories of schools:

1) Schools that had pupils viewing TEC both during the first year and the second year of its broadcast (YES-YES schools);

2) Schools that did not have pupils viewing TEC during its first broadcast year but did have pupils viewing during the second year (NO-YES schools);

Table 3

Post-stratification of Respondents to the Phase I Postcard Survey into Four User/Year Categories, with Number of Schools Sampled for the Phase II Survey Shown by User/Year Category

VIEWED TEC IN 1971 - 1972	VIEWED TEC IN 1972 - 1973: YES	VIEWED TEC IN 1972 - 1973: NO
YES	YES - YES (1,063)	YES - NO (394)
NO	NO - YES (519)	NO - NO (1,018)

TOTAL PHASE II SAMPLE = 2,994

3) Schools that had pupils viewing TEC during its first year of broadcast but discontinued its use during the second broadcast year (YES-NO schools); and

4) Schools that had no pupils viewing TEC during either of its broadcast years (NO-NO schools).

Information necessary to classify schools into one of these user/year categories was solicited by means of a fold-and-tear postcard questionnaire sent to the sample of 15,125 schools described above. The total response to the Phase I survey was approximately 7,500 schools.

Sampling Design: Phase II

The sample responses to the postcard survey of the initial sample of 15,125 schools were post-stratified into the four user/year categories described above. The restriction was imposed that there be a minimum of one school per stratification cell having non-zero representation in any user/year category. From within the YES-YES user/year category 1,063 schools were sampled. From the NO-NO yser/year category 1,018 schools were sampled. There were two few schools falling into the NO-YES and YES-NO user/year categories (519 and 394, respectively) that responded to the Phase I postcard survey to warrant sampling for Phase II. The result was a total Phase II sample size of 2,994 schools.

Survey Operations: Phase II

The Phase II questionnaires were mailed to the principals of the sample schools in late December of 1972. A second mailing to non-respondents was undertaken in mid-January of 1973 and a telephone survey of a sample of non-respondents to the two mailings was conducted during the first week in February 1973. The overall response rate to the mailed questionnaires was 55.1% and to the telephone survey 66.7%, for an overall response rate of 63.5%.

Survey Operations: National Survey of Teaching Aids (NSTA)

The sample used for the National Survey of Teaching Aids was identical to the Phase II sample for the TEC in-school utilization survey.

A separate four-page questionnaire to measure numerous organizational characteristics of the 2,994 schools in the Phase II sample was mailed out under the letterhead of the Center for the Study of Education, Institute for Social Research at Florida State University and made no mention of "The Electric Company" or the Children's Television Workshop. The NSTA questionnaire, as were the TEC questionnaires, was designed to be completed by the school principal.

The first mailing of the NSTA questionniare was undertaken in mid-January and a second mailing to non-respondents was sent out approximately three weeks later. Limited funds did not permit either a telephone follow-up or a third mailing to non-respondents to the first two mailings. Response to the two NSTA mailings consisted of 1,930 usable returns, a 64% response rate.

As a result of the match/merge process 1,137 schools were identified that had responded to both the TEC in-school utilization and NSTA questionnaires. These 1,137 school, grouped by user/year categories as follows, constitute the sample upon which this study is predicated:

- YES-YES = 463
- NO-YES = 161
- YES-NO = 227
- NO-NO = 286

Because of the high non-response rate effected by the loss of many schools when the TEC and NSTA data base were match/merged and the selective non-response by NO-NO schools to the TEC questionnaires, we weighted the respondent sample of 1,137 schools to achieve a proportionate representation of the national population of schools.

Dependent Variables: Operational Definitions

Stage 1: State of the Organization.

In Kaplan's model of the change process the first stage references the state of the organization in terms of the existence of a condition (problem) that needs to be changed. Such a condition in an elementary school that is related to the intent of TEC would be that a high proportion of children in the school are below grade level in reading ability. Therefore we will use, as an indicator of the severity of an organizational problem relevant to the adoption of TEC, the percent of children in grades 1-4 in the school who are below grade level in reading ability.

Stage 2: Diagnosis

In the second stage of the change process an organization should assess innovative ideas in the field and select a course of action. We have used a binary indicator for Stage 2 -- either the school principal had made an assessment of the utility of TEC or he had not.

Stage 3: Initiation

During the third stage of the change process the groundwork for the proposed change should be laid in terms of reallocating existing resources, delegating responsibilities, acquiring necessary materials or equipment, etc.

The indicator used to operationally define the extent of a schools' initiation activities is how many of five initiation activities were undertaken by a school to implement utilization of TEC:

(1) revision of the school's reading curriculum,
(2) special scheduling arrangements,
(3) consultation with reading specialists,
(4) repair of existing TV equipment,
(5) acquisition of additional TV sets.

The result is an "initiation activities" score with a possible range of from 0 to 5. Schools in the NO-NO and YES-NO user/year categories were assigned a score of "0" for Stage 3.

Stage 4: Introduction

During the fourth stage of the change process there should be an organization-wide dissemination of information about the proposed innovation. The indicator used to operationally define the extent of the introduction activities conducted by a school is how many of two activities were undertaken to disseminate information about TEC within the organization. The two activities are:

(1) conducting workshops for teachers regarding the use of TEC; and

(2) subscription to the program guide for TEC.

The result is an "introduction activities" score with a possible range from 0 to 2. Schools in the NO-NO and YES-NO user/year categories were assigned a score of "0" on this scale.

Stage 5/6: Extent of Adoption

Note again that the data available for this study do not allow us to make a clear operational distinction between Kaplan's Stage 5 (Transition) in which there should be a high rate of adoption of the innovation by members of the organization, and Stage 6 (Routinization) in which adoption of the innovation should be as widespread as possible among members of the organization. We have collapsed Kaplan's Stages 5 and 6 into an "extent of adoption" stage which conceptually is more similar to Kaplan's Stage 6 (Routinization) than to his Stage 5 (Transition). In the case of "The Electric Company" this procedure probably loses little, if any, of the conceptual power of Kaplan's model of organizational change. Within any specific school, adoption of TEC by teachers probably went from zero to the maximum to be reached within the school within an extremely brief time period (say, six weeks or less from the broadcast date of the first show of the school year). This type of situation probably effectively bypasses Kaplan's Stage 5.

The operational indicator for Stage 5/6 (Extent of Adoption) is defined as the percent of children in grades one through four who were viewing TEC in school at the time the second-year survey was conducted. This means that all schools in the NO-NO and YES-NO user/year categories had a Stage 5/6 score of 0%. Schools in the YES-YES and NO-YES user/year categories had an extent of adoption score equal to the percentage of pupils viewing TEC as reported by the principal.

Independent Variables: Operational Definitions

In this section we discuss the operational definitions of the independent variables employed in this study, organized in terms of the four broad categories of influencing factors represented in the "restricted" conceptual model:

- Characteristics of Organizational Members
- Characteristics of the Organizations (Schools)
- Characteristics of the Organization's Environment
- Characteristics of the Organization's Throughput (Pupils).

Within each of the first three categories of factors (characteristics of organizational members, characteristics of organizations, and environmental characteristics) we started with multiple items intended to measure each of several conceptual dimensions. Consequently we turned to factor analysis as a method of reducing the large number of individual variables within each of these three categories into subsets composed of linear combinations of the common variance of the original variables. The final factor solutions were orthogonally rotated suing the VARIMAX rotation algorithm. Composite factor scores for each factor within each of the three categories were computed using the SPSS (Nie et al., p. 488) algorithm, which employs all variables included in the factor solution.

With these points in mind we turn to a discussion of the operational definitions of the independent variables employed in this study.

Characteristics of Organizational Members

Factor 1, which is labelled "Social Network Sources of Information," is a function of evaluations of TEC which the principal had received from four social network sources: central office personnel, educators in other schools, teachers within his own school, and parents and community leaders. Whether or not the principal had viewed TEC personally also loads fairly heavily on Factor 1, which is consistent with having received positive evaluations from several sources in a social, interpersonal network.

Factor 2, labelled "Cosmopolitan/Mass Media Sources of Information," is defined by the extent to which a principal knows about TEC vis impersonal, mass media sources -- radio, newspaper and magazine or journal coverage.

Factor 3, labelled "Audio-Visual Aids Orientation," is a bipolar factor that contrasts those principals who would allocate additional resources to additional audio-visual aids with those who would allocate the additional resources to increased teachers' salaries.

Factor 4, "Creator of the Innovation as a Source of Information," is defined by principals who knew about TEC via a direct mailing from the Children's Television Workshop and who had read the Teacher's Manual for TEC (prepared by CTW).

Factor 5, "Book Orientation," contrasts principals who would allocate additional resources to the acquisition of library or textbooks with those who would allocate the additional resources to teachers' salaries.

Factor 6, "Technical Source of Evaluations," is defined by a single variable -- whether or not the principal had read the report on utilization of TEC entitled, "Who Watched the Electric Company."

Characteristics of the Organization (School)

Fifteen variables measuring organizational characteristics of the schools were factor-analyzed:

1) Size of the school is operationally defined using three indicators,
   (a) the total number of pupils in grades 1-4;
   (b) the total number of teachers in grades 1-4; and
   (c) the pupils/teacher ratio in grades 1-4.

2) The innovative (technological) climate of the school. This concept addresses the extent to which an internal climate of innovativeness prevails within a school. Put differently, it asks the question of whether or not a school has had a history of adopting and using educational innovations. To measure this concept we ascertained two things:

   (a) The total number of all of the following media available for use in grades 1-4, standardized on the number of pupils:
      -- TV sets
      -- motion picture projectors
      -- filmstrip viewers
      -- tape recorders and cassettes
      -- phonographs
      -- sets of "learning materials" (e.g., SRA or IPI materials)

   (b) The typical degree of use of the aids listed above in grades 1-4, as indicated by the principal's responses to the question, "How often are each of these media used in grades 1-4?" Responses were scored as indicated below:

very often	=	5
often	=	4
occasionally	=	3
seldom	=	2
never	=	1

The operational indicator for each medium is an interaction variable computed by multiplying the standardized number in the school (a) by the degree of use (b). In addition, the number of TV sets per pupil was included because of its direct relevance to the nature of the innovation.

3) Structure of the learning situation. We identified three dimensions of the "openness," or structure of the learning situation. The first dimension is the extent to which instruction takes place in self-contained classrooms. The second is the extent to which a pupil receives instruction in all areas from the same teacher. The third dimension is the extent to which instruction is individualized, as opposed to all children in the same class receiving the same instruction and assignments. Each of these dimensions were rated on a scale of 1 to 5 as indicated below:

very little or none (0% - 10%	= 1
somewhat (11% - 40%)	= 2
about half (41% - 60%)	= 3
mostly (61% - 90%)	= 4
almost entirely (91% - 100%)	= 5

4) Centralization. One item was available to measure the degree of centralization in the schools. Principals were asked who made the final decision regarding use of TEC in their schools. Responses were scored from least to most centralized, as follows:

Individual teachers decided for their own pupils	= 1
A group of teachers decided for the entire school	= 2
The school principal decided	= 3
A person in an educational administrative position outside this school decided	= 4
The school board decided	= 5

Five significant factors accounted for 75.9% of the total variance among the 15 variables.

Factor 1, "Orientation to Traditional Technological Teaching Aids," is defined by the interaction variables (number/pupil times degree of use) indicating the degree of orientation toward the use of three simple and basically traditional technological teaching aids: filmstrip viewers, phonographs and tape recorders.

Factor 2, "TV Orientation," is defined by the number of TV sets per pupil and the use-of-TV interaction variable. The use-of-learning-materials and use-of-motion-picture-projectors variables also load somewhat on Factor 2, although they clearly define a separate factor by themselves.

Factor 3, "Size of School," is defined by three variables: the total number of teachers in grades 1-4; the total number of pupils in grades 1-4; and the pupil/teacher ratio.

Factor 4, "Motion-Pictures/Learning Materials Orientation," is defined by the two interaction variables that alos loaded slightly on the "TV Orientation" factor: use of motion picture projectors and use of learning materials. These two variables consistently loaded together during the iterations of the factoring process, and a definition of their conceptual commonality is ambiguous.

Factor 5, "Openness of the Learning Situation," is clearly defined by the three indicators of the structure of the learning situation: the extent to which children receive all instruction in the same room, receive all instruction from the same teacher, and the extent to which all pupils receive the identical instruction.

Characteristics of the Environment

Four aspects of a school's environment were identified as likely to be relevant to organizational innovation: (1) turbulence; (2) support for innovation; (3) urbanization; and (4) modernity.

1) Environmental turbulence. The turbulence of a school's environment refers to the extent to which the school/environment is smooth or conflict-ridden, as well as to the extent to which the environment atively attempts to influence the school's operations. Four indicators of environmental turbulence were used:

(a) The typical number of times per week the school principal was contacted (via telephone, personal visit, letters, etc.) by parents attempting to influence the school's policies or practices;

(b) Whether or not the school, during the previous three years, had been involved in each of the following:

-- dispute over the choice or retention of a textbook;
-- dispute over the choice or retention of a teacher;
-- dispute over the school's dress code;

2) Environmental support for school innovation. Two indicators of environmental support for school innovation were used:

(a) The principal's rating of how parents generally feel about the school trying out educational innovations, as scored below:

strongly opposed	=	1
somewhat opposed	=	2
disinterested or neutral	=	3
somewhat in favor	=	4
strongly in favor	=	5

(b) An interaction variable constructed by multiplying the number of contacts per week by the principal's rating in (a) above; and

(c) Whether or not TEC was being broadcast during school hours.

3) Urbanization of the school's environment. Several indicators of the urbanization of the environment of the school were used:

(a) The size of the community:

large city = 4
medium city = 3
small town = 2
rural area = 1

(b) A more refined measure developed for the NSTA questionnaire in which the principal was asked to indicate the percent of pupils residing in neighborhoods best described as:

-- urban residential
-- suburban residential
-- non-suburban, small town
-- rural, not on a farm
-- rural, farm

(c) The SES of the community.

4) Modernity of the environment. The modernity of the environment refers to the modernity of the state in which the school was located. This variable was operationally defined by using the 1970 state modernity scores created by Herriott and Hodgkins (1973, see especially pages 109-116).

Six factors accounted for 63.9% of the total variance in the 15 variables:

Factor 1, "Active Disposition to Innovate," is defined by the number of personal contacts the principal received during a typical week and the interaction variable combining number of contacts and parents' attitudes toward school innovation.

Factor 2, "Size and Modernity," is defined in terms of the size of the county in which a school was located, pupils from suburban residential neighborhoods and the state modernity score. Rural farm areas load negatively on this factor.

Factor 3, "Suburban vs. Urban Residential," is defined in terms of a contrast between schools whose pupils reside primarily in suburban, as opposed to urban, residential neighborhoods.

Factor 4, "Environmental Turbulence," is defined by the occurance of disputes between the school and its environment over retention or hiring of a teacher, dress codes, and textbooks.

Factor 5, "Suburban Residential, Favoring School Innovation," is defined by schools serving primarily suburban residential areas in which parents hold generally favorable attitudes toward school innovation. Non-suburban small towns load negatively on this factor.

Factor 6, is defined by the single variable indicating "Broadcast of TEC."

Characteristics of Organizational Throughput (Pupils)

Two aspects of the primary throughput of schools, pupils, were measured and used as variables in this study:

1) The percent of pupils in the school who came from families with an estimated annual income of less than $5,000; and

2) The percent of the student body that is Black.

We have now described the operational definitions of each of the variables that we used in the analysis of the process of organizational change in this study.

HYPOTHESES AND ANALYSIS STRATEGY

In Table 2.2 we presented the restricted conceptual model of the interrelationships of 5 stages in the process of organizational change by 4 categories, or sets, of influencing factors (plus the results of previous states) that may be tested with the data available for this study. In the preceding sections we provided the operational definitions for each of the five stages in the change model and for each component; or dimension, of each of the four sets of influencing factors. We may now state in terms of three general multiple regression/correlation equations, the three levels of hypothese implied by our conceptual model regarding the interrelationships among the 5 stages of the change model and the

4 sets of influencing factors and their components.

The first level, and most basic set of hypotheses, is represented by:

$$(1) \qquad R^2_{S_i \cdot I_1 I_2 I_3 I_4 I_{ps}} > 0$$

where

$S_{i(i=1,5)}$ = Stage 1, Stage 2, Stage 3, Stage 4, Stage 5;

I_1 = the set of influencing factors that define throughput (pupil) characteristics;

I_2 = the set of influencing factors that define characteristics of organizational members;

I_3 = the set of influencing factors that define characteristics of the organization;

I_4 = the set of influencing factors that define characteristics of the organization's environment; and

I_{ps} = the set of influencing factors that define the results of stages in the change model prior to S_i.

The general equation (1) states the multiple hypotheses that the squared multiple correlation of all 4 sets of influencing factors plus the results of prior stages with the outcome measure for a stage S_i will be greater than zero at each stage of the model. If all of the sets of influencing factors, plus the results of prior stages, together do not explain a statistically significant proportion of the variance in an S_i, there is little point in carrying the analysis of the stage further, since the most basic hypotheses posed by our conceptual model will have been refuted.

An appropriate test of significance for the statistical departure of R^2 from zero is provided by Cohen (1975, p. 104) as:

$$(2) \qquad F = \frac{R^2 (n-k-1)}{(1-R^2)k} ,$$

with df = k and n-k-1, and where n is the sample size and k is the number of right-hand-side (r.h.s.) variables.

Should, however, the R for an S be greater than zero we will procede to test the second level of hypotheses for each stage in the change model. The second level of hypotheses may be represented by:

$$(3) \quad R^2_{S_i \cdot [I_j \cdot \ldots (I_j) \ldots I_{ps}]} > 0$$

where

$S_i \cdot [I_j \cdot I_1 \ldots (I_j) \ldots I_{ps}]$ represents the squared multiple correlation of the k r.h.s. variables in set I_j with S_i after the remaining h-1 sets have been partialled from S_i, and the (I_j) term within the brackets signifies omission from the sets being partialled.

The general equation (3) states the multiple hypotheses that at each stage, S_i, each set, I_j, will account for a non-zero proportion of variance in S_i after the variance accounted for by the remaining sets of I's have been partialled from S_i. Stated differently, equation (3) hypothesizes that at each S_i, each set, I_j, of influencing factors will uniquely account for a statistically non-zero proportion of variance in S_i.

An appropriate test of statistical significance for the departure from zero of the unique variance accounted for by a set of r.h.s. variables is provided by Cohen and Cohen (1975, p. 135) as:

$$(4) \quad F = \frac{(R^2_{S \cdot AI} - R^2_{S \cdot A})/k_i}{(1 - R^2_{S \cdot AI})/(n-k_a-k_i-1)}$$

with df = k_i, and $n-k_a-k_i-1$; and where

I represents the set of r.h.s. variables whose unique variance is being assessed;

k_i is the number of r.h.s. variables in the set, I;

A represents the aggregate set defined by all r.h.s. variables not in the set, I; and

k_a is the number of r.h.s. variables in the aggregate set whose unique variance is not being assessed.

Should the proportion of variance in S_i uniquely accounted for by the set, I, not be statistically significant from zero we will terminate our analysis of the set for the specified S_i at the second level, as that aspect of our conceptual model will have been refuted. If the proportion of variance in the S_i uniquely accounted for by the set, I, is statistically significant we will procede to the third level of analysis for the set.

The third level of hypotheses to be tested addresses the question of the relative importance of the individual components (variables) within the sets of influencing factors, in terms of the the unique proportion of variance in the S_i accounted for by each of the individual components.

To accomplish the third level of analysis we will partition the unique portion of variance in S_i accounted for by set I_j into the unique proportions of variance accounted for by the individual components of the set. The task of partitioning the proportion of variance in S_i accounted for by I_j into the unique proportions accounted for by the individual components of I_j is relatively straightforward because of the way the components of the sets were defined. The reader will recall that (with the exception of pupil characteristics) the individual components within each set of influencing factors were created on the basis of orthogonally rotated factor structures, using the loadings of all variables on the factors, and are therefore uncorrelated with each other. Therefore the increment to $R^2_{S \cdot AI}$ added by each component of I_j as it enters the equation in a stepwise regression is the unique proportion of variance in S_i

accounted for by each component of I_j.

There is one exception to this procedure for partitioning the variance among the components within a set -- pupil characteristics. In the case of pupil characteristics we have defined only two components (percent of pupils from low income families and the percent of pupils who are Black). No factoring was performed on this set and the two components are correlated and therefore share some portion of variance in S_i for which they together account. We will assign the variance shared by these two variables to whichever enters the regression equation first.

In addition to presenting the unique proportions of variance in each stage S_i accounted for by each set I_j and each component within significant sets, we will also present a value for each S_i that we will label "interrelated variance." This value is the difference between the $R^2_{S_i \cdot I_1 I_2 I_3 I_4 I_{ps}}$ and the sum of the unique proportions of variance accounted for by all of the sets of influencing factors for any specified stage. Since our sets (and components across sets) are not necessarily uncorrelated, the unique proportions of variance in S_i they account for do not sum to the total R^2 for the stage. The reader is warned that the value labelled "interrelated variance" is a heuristic number that may be useful in representing the extent and complexity of the interrelationships among all the r.h.s. variables and the dependent variable in the equation. This number may not be interpreted correctly as the proportion of "common variance" in the dependent variable shared by the r.h.s. variables (although the temptation is great). As Cohen (1975, p. 135) points out, this number can be negative, in which case it is an imaginary number as a negative proportion of variance is an impossibility (unless, of course, one is capable of dealing with the concept of a negative area in a hyperspace). This does not, however, deny the heuristic utility of the number as a gross indicator of the extent to which complex interrelationships exist among the variables in the equation.

With these points in mind we now turn to the results of our three-level analysis of the interrelationships among the stages in the model of organizational change and the sets of influencing factors.

PRESENTATION OF RESULTS

In this section we present the results of our analysis of the interrelationships of four sets of influencing factors with the stages in the model of organizational change. We proceed by first examining the proportions of variance accounted for at each stage of the change model by each set of influencing factors, plus the results of prior stages. In the second section we address the question of changes in the relative importance of each set of influencing factors and prior stages across successive stages in the change model.

The results of our analyses are presented *in toto* in Table 4 on the following page. A note regarding how to read Table 4 is in order. The independent variables (sets of influencing factors, and each component within the sets) are identified by the rows down the left-hand side of the page. The dependent variables (each of the five stages in the change model) are represented by the five columns across the top of the page. The bottom row of the table presents the total percent of variance in each stage accounted for with <u>all</u> the independent variables identified in the table in the regression equation. The bold-face numbers within a column are the percentages of <u>unique</u> variance in the outcome measure for the stage that are explained by each <u>set</u> of influencing factors. In parentheses directly below the percent of unique variance accounted for by a set is ($p < .xxx$), the probability of that percent of variance being accounted for at random by the set. Below each percent of variance accounted for by a set are displayed the percentages of unique variance in the outcome measure for the stage accounted for by each of the individual components of the set. The sum of the percents of unique variance

Table 4: The Total and Unique Proportions of Variance Accounted for by Sets of Influencing Factors and Their Components in Each Stage of the Organizational Change Model

SETS OF INFLUENCING FACTORS & (dimensions within sets)	STAGES IN THE PROCESS OF ORGANIZATIONAL CHANGE				
	STAGE 1: PROBLEM	STAGE 2: DIAGNOSIS	STAGE 3: INITIATION	STAGE 4: INTRODUCTION	STAGE 5: ADOPTION
THROUGHPUT CHARACTERISTICS	**20.1%** ($p < .000$)	**N.S.**	**N.S.**	**N.S.**	**N.S.**
• % of pupils under $5,000 annual family income	18.9%	–	–	–	–
• % of pupils Black	1.2%	–	–	–	–
ORGANIZATION MEMBERS' CHARACTERISTICS	**N.S.**	**35.7%** ($p < .000$)	**7.4%** ($p < .000$)	**2.8%** ($p < .000$)	**N.S.**
• Social network sources of evaluations	–	27.2%	1.9%	0.1%	–
• Cosmopolitan (mass media) sources of evaluations	–	0.0%	0.2%	0.0%	–
• Orientation toward A-V instructional aids	–	0.1%	0.0%	0.2%	–
• Creator of innovation as a source of information	–	4.4%	5.3%	2.5%	–
• Orientation toward books for instruction	–	2.2%	0.0%	0.0%	–
• Technical source of evaluations	–	1.8%	0.0%	0.0%	–
ORGANIZATION'S CHARACTERISTICS	**5.8%** ($p < .000$)	**N.S.**	**3.2%** ($p < .000$)	**N.S.**	**1.6%** ($p < .000$)
• Oriented toward use of simple, traditional teaching aids	3.3%	–	0.1%	–	0.4%
• Oriented toward use of TV as a teaching aid	0.4%	–	2.7%	–	0.7%
• Size of school	1.0%	–	0.0%	–	0.5%
• Oriented toward use of movies and learning materials	1.0%	–	0.2%	–	0.0%
• Openness of the learning situation	0.1%	–	0.2%	–	0.0%
ENVIRONMENTAL CHARACTERISTICS	**2.0%** ($p < .000$)	**3.0%** ($p < .000$)	**3.4%** ($p < .000$)	**N.S.**	**N.S.**
• Active disposition to have school innovate	0.3%	0.0%	0.1%	–	–
• Large, modern, suburban residential location	0.9%	0.0%	0.0%	–	–
• Suburban residential vs. urban residential location	0.0%	0.3%	0.0%	–	–
• Turbulent environment	0.0%	0.0%	0.0%	–	–
• Suburban residential, favoring school innovation	0.6%	0.5%	0.0%	–	–
• TEC broadcasting during school hours	0.2%	2.0%	3.3%	–	–
PRIOR STAGES	**NA**	**N.S.**	**1.0%** ($p < .000$)	**3.0%** ($p < .000$)	**10.1%** ($p < .000$)
• Stage 1: Problem	NA	–	0.5%	0.7%	0.0%
• Stage 2: Diagnosis	NA	NA	0.4%	0.0%	0.7%
• Stage 3: Initiation	NA	NA	NA	2.3%	9.4%
• Stage 4: Introduction	NA	NA	NA	NA	0.0%
"INTERRELATED VARIANCE"	**6.6%**	**8.2%**	**12.7%**	**10.4%**	**12.7%**
TOTAL VARIANCE EXPLAINED IN STAGE	**34.5%** ($p < .000$)	**46.9%** ($p < .000$)	**27.8%** ($p < .000$)	**16.2%** ($p < .000$)	**24.4%** ($p < .000$)

accounted for by the individual components within a set equal the total unique variance accounted for by the set. The sum of the unique variances in a specified stage that are accounted for by all the sets of influencing factors does not, however, equal the total percent of variance in the stage accounted for with all independent variables in the equation. This point leads us to the second row from the bottom in Table 4.1, which is labelled "Interrelated Variance." This number equals the total variance in the stage accounted for by all variables minus the sum of the unique variances accounted for by each set of influencing factors. The reader is reminded again that this number is not properly interpreted as a percent of shared or common variance in a stage accounted for by the independent variables. It is presented as an heuristic device that provides some indication of the extent and/or complexity of the interrelationships among the predictors and the outcome.

With these points in mind we now turn to a discussion of the results of our analyses.

WITHIN-STAGE ANALYSES

Stage 1 (Problem Condition) Results

The percent of pupils below grade level in reading ability in grades 1-4 has been used to operationally define the existence of a problem condition within a school. Our Level 1 Hypothesis states the expectation that we will be able to account for a significant proportion of the variance in the percent of pupils below grade level in reading ability. Turning to Table 4.1, the bottom row of the "Stage 1" column, we see that all four sets of influencing factors together account for 35.4% of the variance in the percent of children below grade level in reading. This large a proportion of variance is both substantively and statistically significant ($p < .000$). We may therefore examine the proportions of unique variance accounted for by each of the sets of influencing factors to obtain an assessment of their relative importance in explaining the existence of a reading problem within schools.

Our Level 2 Hypotheses state the expectation that each set of influencing factors will account for a statistically significant proportion of variance in the percent of pupils below grade level in reading ability.

The set of pupil (throughput) characteristics accounts for 20.1% of the variance in the reading problem, indpendently of all other sets in the model ($p < .000$). As would be expected, the set of pupil characteristics is by far the strongest (but not the only) determiner of a reading problem within a school. Since the set of pupil characteristics is significant, we may examine the individual components within the set to assess their relative importance (Level 3 Hypotheses). The percent of pupils from low income families uniquely accounts for 18.9% of the variance in the outcome measure, which is some 94% of the variance accounted for by the set. The percent of the student body that is Black adds an additional 1.2% to the variance accounted for by the proportion of pupils from low income families.

The set of characteristics of organizational members does not account for a significant proportion of variance in Stage 1 and we therefore will not examine any of its individual components.

The set of organizational characteristics of the school accounts for 5.8% of the variance in the proportion of pupils below grade level in reading ability independently of all the other predictors. While substantially smaller than the 20.1% accounted for by pupil characteristics, this is also a significant value ($p < .000$). Among the individual components of organizational characteristics, the factor representing an orientation toward the use of the simpler, more traditional technological teaching aids shows the strongest association with the existence of a reading problem, uniquely accounting for some 3.3% of the variance in Stage 1. The factors representing school size and an orientation toward the use of motion pictures and learning materials show a rather nominal independent association with the prevalence of a reading problem, each accounting uniquely for about 1% of the variance in Stage 1. A TV orientation

and the openness of the learning situation each account for less than 1% of the variance in Stage 1.

While it is comfortable to discuss the variance in the percent of pupils below grade level in reading ability accounted for by pupil characteristics in terms of causality, this is not true for organizational characteristics. In the case of pupil characteristics there is extensive literature that documents the (probably causal) effects of student background traits (and especially SES) on academic achievement. Organizational characteristics, especially the use of certain types of technological teaching aids (e.g., filmstrip viewers or tape recorders), may well be an organizational response attempting to overcome a problem rather than the cause of the problem.

The set of environmental characteristics also uniquely accounts for a small, but significant proportion of the variance in Stage 1 (2%, $p < .000$). All of the components within the environmental set, however, individually account for very small proportions of variance. The component representing the size of the school's location is the strongest of the environmental characteristics, uniquely accounting for only 0.9% of the variance in Stage 1. It is not surprising, however, that environmental characteristics account for such a small proportion of the variance in the extent of a reading problem within a school after the more direct (and probably causally more proximate) measures of pupil characteristics have been partialled out.

The sum of the unique proportions of variance in Stage 1 accounted for by the four sets of influencing factors is 27.9%. Since the total proportion of variance in Stage 1 accounted for by all four sets of influencing factors is 34.5%, the value of the heuristic "interrelated variance" is 6.6%, a gross indicator of the extent of complex interrelationships among the four sets of influencing factors and the Stage 1 outcome measure.

In summary, we have found that the characteristics of a school's pupils is by far the set of factors most strongly associated with the extent of a reading problem in the school, probably in a direct

causal relationship. The specific characteristic accounting for most of this relationship was the SES of the student body in the school. We found that the set of factors representing the organizational characteristics of the school were correlated with the extent of a reading problem, but much less strongly than pupil characteristics. The specific organizational characteristic accounting for most of this relationship was on orientation towards, or history of, the use of older, more traditional technological teaching aids. This correlation was interpreted as likely to be the result of an attempt on the part of a school to deal with educationally disadvantaged pupils in the school, rather than as a factor contributing to the problem. In addition to the sets of pupil and organizational characteristics, environmental characteristics as a set accounted for a small proportion of the variance in the extent of a reading problem within the schools, although none of the individual factors accounted for meaningful proportions of variance.

Stage 2 (Diagnosis) Results

As the indicator for Stage 2 we used a binary variable indicating whether or not the school principal had made an assessment (positive or negative) of "The Electric Company." Referring again to Table 4.1 we see that our Level 1 hypothesis has not been refuted, as all sets of influencing factors together account for 46.9% of the variance in the Stage 2 outcome indicator ($p < .000$).

Moving to our Level 2 hypotheses and examining the relative contributions of the sets of influencing factors we find that three of the sets had no significant unique correlation with whether or not a diagnosis was made: pupil characteristics, organizational characteristics, and the extent of the reading problem that defined the status of the school at Stage 1 (which is effectively another indicator of the pupil characteristics at this point). These sets therefore are dropped from further investigation at Stage 2, leaving two sets of factors that have accounted for significant unique proportions of variance in the diagnosis indicator: the characteristics of organizational members and characteristics of the environment.

The set of characteristics of members of the organization (specifically, of the principal) uniquely accounted for the largest portion (35.7%, $p < .000$) of the variance in the diagnosis indicator. In terms of our Level 3 hypotheses, the evaluations of TEC the principal received from social network sources uniquely accounted for 27.2% of the variance in the diagnosis made/not made indicator, and some 76% of the variance accounted for by the set of characteristics of the members of the organization. The component representing the creator of the innovation -- the principal having received a direct mailing of information about TEC from CTW and having read the Teacher's Manual -- accounted for the next largest unique proportion of variance, at 4.4%. Beyond this, the component dealing with the resource allocation priority for books adds an additional 2.2% of the variance and the component indicating whether the principal knew about TEC via reading the research report on viewing patterns around the nation added 1.8%. Surprisingly, the principal's orientation toward allocating additional resources to the acquisition of additional audio-visual aids added nothing, as did the number of mass media sources of information about TEC.

The set of environmental characteristics accounted for 3% of the variance in addition to that of organizational members. Whether or not TEC was being broadcast during school hours accounts uniquely for 2% in the diagnosis measure and the other components of the set do not account for meaningful amounts of variance. It is quite surprising that the two components representing the environment's disposition to favor school innovation do not provide significant unique correlations with the diagnosis made/not made measure. It may be, however, that since the "social networks sources" component of members' characteristics includes evaluations of TEC from parents and community members, the innovative disposition in the set of environmental characteristids was preempted by them. Their contribution to the total proportion of variance in Stage 2 accounted for by all (now) five sets of influencing factors probably is buried in the "interrelated variance" value of 8.2% for Stage 2.

In summarizing our findings regarding Stage 2, it is quite clear that the nature and extent of the interpersonal evaluations received by a principal were the primary determinants of whether or not (s)he had made a diagnosis of the utility of TEC relative to the school's needs.

Stage 3 (Initiation) Results

To operationally define the initiation stage in the change model we counted the number out of five possible initiation activities schools had conducted to facilitate use of TEC. To examine our Level 1 hypothesis regarding Stage 3 we return again to Table 4.1, where we find that all five sets of influencing factors together account for 27.8% of the variance ($p < .000$) in the number of initiation activities conducted by schools. We therefore may procede to investigate our Level 2 hypotheses regarding the relative importance of the five sets of influencing factors. At Stage 3 only one of the sets -- characteristics of pupils -- makes no contribution to accounting for variance.

The set of characteristics of organizational members uniquely accounts for 7.4% ($p < .000$) of the variance in number of initiation activities. Within the set, two components explain most (97%) of the variance accounted for by the set. The strongest is the component representing the creator of the innovation as a source of information (5.3%, $p < .000$). Since this includes the Teacher's Manual plus other information sent by CTW, many suggestions for initiation activities may have been included directly. The second component, social network sources of evaluations, accounts for only 1.9% of the variance in Stage 3. As with the other information source component, it seems likely that a principal intending to use TEC in his/her school would have received suggestions from personal contacts regarding actions that should be taken to facilitate viewing.

The set of organizational characteristics of the school uniquely accounted for 3.2% of the variance ($p < .000$) in initiation activities. The component representing the orientation of the school

toward the use of TV as a teaching aid explains 84% of the variance accounted for by the set of organizational characteristics, and uniquely accounts for 2.7% of the variance in the number of initiation activities conducted. It may well be that experience in the use of TV as a teaching aid leads to more thorough planning for the use of a new show. In addition (or concurrently) previous successful usage may lead to a desire to expand TV facilities.

The set of characteristics of the environment uniquely accounts for 3.5% of the variance in the number of initiation activities conducted by schools. Only one component of the set contributes meaningfully to this value. Whether or not TEC was broadcast during school hours uniquely accounts for 3.3% of the variance in the number of initiation activities in Stage 3.

The results of prior stages uniquely accounts for 1% of the variance in Stage 3. While this value is statistically significant its substantive meaning is questionable, especially since the 1% is spread evenly across the Stage 1 and Stage 2 components of the set.

Finally, the "interrelated variance" value for Stage 3 is 12.7%, or nearly 47% of the total proportion of variance accounted for by all five sets of influencing factors together. This is probably a good indication that the interrelations among the sets, and components across sets, as they relate to initiation activities are highly complex.

In summary, we found two characteristics of the principal (CTW as a source of information about TEC and social network evaluations of TEC), one organizational characteristic (orientation toward use of TV as an instructional aid), and one characteristic of the environment (whether or not TEC was being broadcast during school hours) to uniquely account for meaningful proportions of variance in the number of initiation activities conducted by schools. The value of the interrelated variance, however, indicates a high degree of complexity of interrelationships among influencing factors as they relate to initiation activities.

Stage 4 (Introduction) Results

To operationally define the outcome measure for Stage 4, we counted the number (out of a possible total of two) activities conducted within a school to provide an organization-wide dissemination of information about "The Electric Company." Returning again to Table 4.1, we found that all five sets of influencing factors together accounted for 16.2% of the variance ($p < .000$) in the number of introductory activities conducted within schools. While this proportion of variance is not as large as that accounted for in Stages 1, 2 and 3, it is a significant amount, and we proceed to examine our Level 2 hypotheses.

At Stage 4, three out of the five sets of influencing factors fail to independently account for significant amounts of variance: pupil characteristics, organizational characteristics, and characteristics of the environment. These sets are therefore dropped from further consideration at the introduction stage of the change model.

The set of characteristics of organizational members (the principal) uniquely accounts for 2.8% of the variance ($p < .000$) in the number of introductory activities conducted within a school. A single component within the set explains most of this variance -- the creator of the innovation as a source of information. This factor uniquely accounts for 2.5% of the variance in the Stage 4 outcome measure and nearly 90% of the variance explained by the set. As in Stage 3, this may well be a function of the content of the information received from CTW in terms of pragmatic suggestions regarding what types of activities to conduct to facilitate implementation of TEC.

The set of results of prior stages uniquely accounts for 3.0% of the variance in the Stage 4 outcome measure, approximately the same as that for characteristics of organizational members. Similarly, one of the prior stages explains most of the variance (some 7%) accounted for by the set: the number of Stage 3 (initiation) activities conducted within the school. This component of the set independently accounts for 2.3% of the variance in the number of introductory activities conducted.

The "interrelated variance" value for Stage 4 is quite high

(10.4%), as it was for Stage 3, indicating a high extent and/or degree of complexity in the interrelationships among the five sets of influencing factors and the outcome measure. We are quite surprised, for example, that no organizational characteristics of the schools made significant unique contributions -- especially the size of the school (which is usually a surrogate for complexity).

Stage 5 (Extent of Adoption) Results

The extent of adoption of the innovation has been operationally defined as the percent of pupils in grades 1-4 who had been viewing TEC. The bottom line in Table 4.1 for Stage 5 indicates we could acccount for 24.4% of the variance ($p < .000$) in this outcome measure using all five sets of influencing factors. Again our Level 1 hypothesis has not been refuted and we will examine the unique contributions to this value made by each set of influencing factors. As in Stage 4, three of the sets drop out of our analysis because they made no significant unique contribution: pupil characteristics, organizational members' characteristics, and characteristics of the environment.

The organizational characteristics of the schools as a set uniquely accounted for only 1.6% of the variance ($p < .000$) in the extent of adoption of TEC. Although this is statistically significant, it does not seem particularly meaningful, especially considering it is split among three individual components of the set. Orientation toward the use of TV accounts for 0.7%, the size of the school 0.5%, and orientation toward the use of traditional technological teaching aids 0.4%. This could, however, be interpreted as large schools tending to use technological teaching aids.

On the other hand, the set of results of prior stages in the change model uniquely accounts for 10.1% of the variance ($p < .000$) in the percent of pupils viewing TEC. Within the set, one of the prior stages -- initiation activities -- uniquely accounts for 9.4% of the variance in the Stage 5 outcome measure (93% of the set). Whether or not a diagnosis was made (Stage 2) accounts for the remaining 0.7% in the set.

Again, the "interrelated variance" value is quite high, at 12.7%, leading us to believe there is a complex set of interrelationships among the sets of influencing factors, their individual components and the extent of adoption of TEC.

To summarize the results of our analysis of Stage 5, "Extent of Adoption," we found that the number of initiation activities conducted within a school (Stage 3 results) accounted for by far the largest unique proportion of variance, while the set of organizational characteristics of the school accounted for an additional 1.6% of the variance. The unique proportions of variance accounted for by these two factors still leaves a large amount of variance in the outcome tied up in the interrelationships among the sets of influencing factors and the outcome measure.

ACROSS-STAGE ANALYSES

In the previous section we examined the relative importance of the five sets of influencing factors within each stage. In this section we will examine the changes in the contributions of each set of influencing factors (and components within sets) across the five stages in the change model. We refer again to Table 4.1.

Throughput (Pupil) Characteristics

The characteristics of the organizational throughput showed up as important only in Stage 1, where they dominated the variance accounted for in the prevalence of a reading problem in the school. Within the set, the percent of pupils from low income families was the single component accounting for most of contribution of the set. After Stage 1, however, pupil characteristics failed to account for any variance in Stages 2-5. It is surprising that neither pupil characteristics nor the extent of the reading problem within a school had no effect on whether or not a diagnosis was made in Stage 2.

Characteristics of Organizational Members

The set of characteristics of the members of the organization

(in particular, the principal) showed no independent correlation with Stage 1 of the change model, the extent of a reading problem. They did, however, dominate the variance accounted for at Stage 2 (whether or not a diagnosis was made) made the largest contribution in accounting for the number of initiation activities at Stage 3, and nearly half of the unique variance accounted for in the number of introduction activities conducted at Stage 4. At Stage 5 the unique correlation of members' characteristics was null.

The individual components of the set of characteristics of organizational members varied widely in their contributions to the unique variance accounted for by the set. The principals' involvement in social networks dominated the unique variance accounted for in whether or not a diagnosis was made at Stage 2, then dropped to 2% at Stage 3 and virtually zero at Stage 4. Mass media sources of information made no meaningful contribution at any of the stages in the model, nor did the orientation of the principal toward the use, or acquisition, of audio-visual teaching aids. Whether or not the principal had read the research report on utilization of TEC, and the principals' level of priority for acquiring additional text and/or library books, both made small contributions at the diagnosis stage and then were null at the remaining stages. On the other hand, whether or not the principal was familiar with materials sent by the creator (CTW) of the innovation made substantial contributions at each of Stages 2, 3 and 4.

Organizational Characteristics of the Schools

The set of organizational characteristics of the schools also made significant contributions to the variance accounted for at three stages of the change model, and again, the individual components of the set varied widely in their importance. At Stage 1 the orientation of the school toward the use of the more traditional technological teaching aids was the most dominant component of the set, with size of school and orientation toward the use of movies and learning materials also making small contributions.

At Stage 2, the set of organizational characteristics was null. At Stage 3, however, the set again made a significant contribution in

terms of accounting for variance in the number of initiation activities conducted. This time a single component -- orientation toward the use of TV as a teaching aid -- explained most of the unique variance accounted for by the set.

In Stage 4 the set of organizational characteristics again made a null contribution but at Stage 5, extent of adoption, it returned with a small but significant contribution. At Stage 5, however, the small contribution made by the set was spread across three components: orientation toward the use of the more traditional technological teaching aids, orientation toward the use of TV as a teaching aid, and the size of the school. Surprisingly, the component representing the openness of the learning situation in a school never made a meaningful contribution at any stage of the model.

Characteristics of the Environment

The set of environmental characteristics made moderate contributions to accounting for variance in the first three stages of the change model, and then dropped out during the last two stages. The set made its smallest contribution at Stage 1, where it uniquely accounted for 2% of the variance in the extent of a reading problem within the schools. This proportion, however, was spread across three components, each making very small individual contributions. At Stage 2 and Stage 3, one component explains most of the variance accounted for by the set: whether or not TEC was broadcast during school hours.

Several of the components of the set of environmental characteristics never made a meaningful contribution in terms of accounting for variance in any of the stages: an active dispostion to have the school innovate, the suburban vs. urban residential location, the suburban residential location with a favorable attitude toward school innovation, and the turbulence of the environment. The component representing the size and modernity of the environment accounted for a small proportion of variance in Stage 1 and then dropped out.

Prior Stages

The importance of prior stages for successive stages is a fundamental assumption of Kaplan's model of the process of organizational change, an assumption we accepted as a hypothesis to be tested during the course of our analyses. At Stage 2 we found that the extent to which a reading problem existed within a school (the operational definition of Stage 1) made no unique contribution to determining whether or not a diagnosis regarding the value of TEC had been made. At Stage 3, the results of prior stages made a statistically significant, but very small, contribution to accounting for the variance in the number of initiation activities conducted.

In Stage 4, with the number of introduction activities conducted as the indicator, we found that the set of results of prior stages accounted for the largest proportion of unique variance among all the sets. The number of initiation activities conducted (the Stage 3 results) explained most of the variance accounted for by the set. At Stage 5 we found that the set of results of prior stages dominated the unique variance accounted for in the percent of pupils in a school who were viewing TEC, uniquely explaining a little more than 10% of the variance. Within the set, Stage 3 (the number of initiation activities conducted) clearly stood out as the dominating factor. Clearly, we have not been able to reject the basic hypotheis that the results of prior stages are important in determining the outcomes of successive stages, especially the later stages in the model.

This concludes the presentation of the results of our analyses of the interrelationships among the five stages of a model of organizational change and four sets of influencing factors, plus the results of prior stages. In the next chapter we shall reflect on our findings -- their relationship to previous research and their implications for future research.

SUMMARY AND CONCLUSIONS

The impetus for this study stemmed from two basic observations regarding the literature on organizational change and innovation. On the one hand, many writers have pointed out that organizational change is a process, and have developed conceptual models of the stages through which an organization could, should, or must sequentially pass if it is to successfully change or adopt an innovation. Authors concerned with organizational change as a multi-stage process, however, typically have given slight consideration to the factors that might impede or facilitate success at the various stages in the process. On the other hand, many writers have noted numerous factors that influence, affect, or are correlated with organizational change or innovation, or an organizational propensity to change or innovate. Unfortunately, authors writing from this perspective usually have not defined the importance of thier influencing factors relative to the stages in a clearly defined model of organizational change as a process. We therefore set out to integrate these two approaches to the study of organizational change with the hope of developing a conceptual model that would provide useful guidelines for further research.

In the preceding chapter we presented the results of our statistical analyses from two perspectives. The first examined the relative importance of the sets of influencing factors (and the individual components of the sets) within each stage of a change model. The second perspective addressed the basic question of changes in the importance of each set of factors across the stages in the model. We found that each set of influencing factors (including the the results of prior stages was important at one or more of the

stages in the change model. We also found that no set of factors was important at every stage.

We now would like to reflect upon some of the implications of this study in terms of possible contributions to the development of a more refined model of the process of organizational change and innovation. We raise many more questions than we define conclusions, especially when we take into consideration the conceptual and methodological constraints of the study.

We began by adapting a seven-stage model of the process of organizational change developed by Kaplan (1971). We were able to use the first four stages of this model as Kaplan had described them but we had to delete the final stage from consideration entirely, and collapse the fifth and sixth stages into our "final" stage because of design limitations -- we did not have longitudinal data. We ended up with a sequential five-stage model of the process of organizational change. We were not willing, however, to accept *a priori* the premise that a school must sequentially pass through each of these stages in order to successfully adopt the innovation, TEC. Rather, we considered the sequential multi-stage model to be a hypothesis to be tested. Our approach to this problem was to examine the contribution each prior stage made to each subsequent stage in the model, within the context of other potentially influencing factors. We found some interesting results that may be idiosyncratic to elementary schools as complex organizations and/or to the attributes of the innovation we used as the vehicle for studying the change process.

At Stage 1 in the model we assessed the extent of a specific problem within the schools that is directly relevant to TEC -- the percent of pupils below grade level in reading ability. We found that the background characteristics (SES in particular) of pupils explained most of the variance in the degree of this problem we could account for applying all four sets of influencing factors together. This finding was hardly surprising, given that it is almost a truism in recent years' research on educational opportunity and school effects. Organizational characteristics of schools, however, also

contribute substantially to explaining variance in the proportion of pupils below grade level in reading ability. In particular, an orientation on the part of schools to use what we have defined as the simpler, more traditional technological teaching aids (e.g., phonographs, tape recorders, filmstrip viewers) was positively correlated with the proportion of pupils behind in reading. We were reticent to interpret this correlation as indicating that the use of these aids causes the problem with reading, as there is an alternative explanation equally as plausible: that the existence in a school of teaching/learning problems associated with educationally disadvantaged children led to the adoption of the (what are now) more traditional teaching aids. Our data do not provide the information necessary to determine which explanation is correct.

At Stage 2 (Diagnosis) we found that the extent of a reading problem within a school (our Stage 1 indicator) was not predictive of whether or not school management had made an assessment of the value of TEC. (It should have, according to the sequential-stage premise underlying the change model.) Does this finding discredit the change model, at least with respect to the Stage 1/Stage 2 relationship? Probably not, but it does suggest a problem area that needs to be investigated. Kaplan's model of organizational change assumes that the concept of "problemistic search" (Cyert and March, 1963) underlies the diagnosis stage of the change process. That is, when an organization becomes aware of a specific problem, a specific search is conducted to find a solution to the problem. During the past few years, however, informal observations of educators have led the author to believe a somewhat different concept may be operating. Thompson (1967) calls it "opportunistic surveillance." Opportunistic surveillance refers to an administrative style consisting of a continuous scanning of the environment for opportunities or possibilities for improving the organization. Many educators, administrators and teachers alike, may have been engaged in opportunistic surveillance for some time. That is, many educators seem to be continuously and aggressively searching for better teaching aids and procedures. This

search seems to be motivated by a desire for improvement of education in general rather than by the need to find a solution to a clearly specified, single problem. If this is the case, it would help explain why the extent of a reading problem in the schools was not correlated with either (a) whether or not a diagnosis regarding the value of TEC was made; or (b) the extent of usage of TEC in Stage 5. If educators felt TEC was a positive addition to the teaching techniques already available to them, they adopted it as just that -- a positive addition, even if there were no serious problem to be solved.

This is obviously speculation on our part. We suggest, however, that the distinction between "problemistic search" and "opporunistic surveillance" should be incorporated into future research as one component of the set of organizational characteristics. It may well be an important facet of what Burns and Stalker (1961) referred to as a "climate of innovativeness" in organizations.

There is yet another plausible alternative explanation for why we found no correlation between the existence of a reading problem and whether or not a diagnosis was made regarding TEC. Our data collection instruments ascertained only whether or not a diagnosis was made by the school principal (organizational management). We know from another analysis of the TEC in-school utilization data (Liebert, 1973, p. 57) that a very small percent (less than 5%) of school principals had made the final decision to use or not use TEC in their own schools. They usually had left the decision to the discretion of their teachers. The decision to use or not use TEC was therefore almost totally decentralized. If we had data from individual teachers we may have found substantial correlation of the extent of a reading problem with the diagnosis stage. A major implication of this possibility is the need to obtain information from the persons making the decisions.

There are two additional points regarding our findings at Stage 2. First, the information networks into which the principal is linked are crucial. This may seem almost tautological, but it is

important to note that there are different types of networks and they have differential impacts at different stages in the change model. The evaluations of TEC a principal had received from the school system's central office personnel, educators in other schools, teachers within his own school, and parents and community leaders have an extremely strong impact at the diagnosis stage. We have conceptualized this information system as a "social network" system and it seems that Carlson's (1964) findings regarding the effect of school system superintendents' social network linkages on innovation and change are probably generalizable to school principals.

In addition to the social network information system, information linkages to the creator of the innovation also had an appreciable impact at the Diagnosis stage, an effect that was present at the Initiation and Introduction stages as well.

Beyond linkages into these two information systems, we note that whether or not TEC was being broadcast during school hours also contributed to the diagnosis stage. Interpretation of this finding is somewhat problematic. It may be that the actual broadcast acted as an additional information source for those principals not linked into other information systems. This needs further investigation.

At Stage 3, which consists of initiation activities, we again failed to observe a strong impact of the results of prior stages (extent of problem condition and whether or not a diagnosis was made) on the outcome indicator independent of the effects of the other sets of influencing factors. Both the Stage 1 and Stage 2 indicators made statistically significant contributions to explained variance but they were so small as to be substantively negligible. As with Stage 2, we again found characteristics of the school principal to be strongest among the sets of influencing factors. In the Initiation stage, however, linkages with social network sources of information and those with the creator of the innovation switched rank in terms of relative importance, with linkages to the creator of the innovation the more important of the two. As we noted earlier, the information from CTW may have contained some very concrete suggestions regarding preparatory activities to conduct.

The set of organizational characteristics also came into play at Stage 3, with an orientation toward the use of TV as an instructional aid being the most important factor. From one perspective this finding seems rather anomalous. Schools with experience in using instructional television (ITV) tended to engage in more Initiation activities than did schools with less experience. One could reasonably expect that their experience would render the need for initiation activities null. On the other hand, experience with ITV may have sensitized them to the need to make appropriate arrangements for successful use of TEC. We wish we had the data to resolve this question, but it must remain a point for further investigation.

Whether or not TEC was being broadcast during school hours also contributed to explaining the number of Initiation activities conducted by the schools. We interpret this as the pragmatic reality that if TEC were not available, Initiation activities would be absurd.

At Stage 4: Introduction, the results of prior stages finally started to make their presence felt in the sequential process suggested by Kaplan's model. The results of Stage 3: Initiation, however, was the only one of the prior stages making a meaningful contribution. We suggest two complementary explanations for this finding. First, if a school had devoted the resources to successfully engage in a number of initiation activities, it seems likely that the additional resources would be expended to inform its teachers about the innovation and how to use it. Second, if a school had either not engaged in initiation activities or had been unsuccessful at them, it seems unlikely that additional resources would be expended to inform teachers about the innovation. Again, at Stage 4, we found that information linkages with CTW also had an impact on the number of introduction activities conducted, although somewhat less than on initiation activities at Stage 3.

It is not surprising that environmental characteristics played no discernible role in determining introduction activities since they are definitively an internal organizational matter. We are

surprised, however, that none of the organizational characteristics of the schools showed up as important factors, especially the size of the school and the structure of the learning situation. We recognize that the operational definition of introduction activities available to us for this study is weak, but the totally null effects of the set of organizational characteristics leads us to believe we have totally missed an important organizational characteristic. One possibility is the existence of very efficient, informal communications systems among teachers within schools. Another may be the level of experience among teachers in using innovations similar to the one being adopted. If this were the case, however, it seems that an orientation toward the use of ITV would have been negatively correlated with the number of introduction activities conducted.

At Stage 5: Extent of Adoption, the set of results of prior stages was clearly the strongest set of influencing factors. As at the Introduction stage, the results of Stage 3 (the number of initiation activities conducted) accounted for nearly all of the impact of the set. No other set of influencing factors, with the exception of organizational characteristics, made a contribution to explaining the extent of adoption of TEC. Organizational characteristics had only a nominal impact, and this was spread across three components of the set, the contributions of the components individually being nearly trivial.

These impacts do, however, perhaps martial a minimal amount of support for the hypothesis of Miles (1964) that congruence with the adopting system enhances the probability that an innovation will be adopted. On the other hand, the fact that the structure (openness) of the learning situation never had an impact at any stage in the process makes questionable the Lippett et al. (1967) arugment that the structure and arrangements within schools affect the internal diffusion process.

Again, it is not particularly surprising that the set of envirnomental characteristics showed a null effect on the extent of adoption. It should be pointed out, however, that the two

environmental factors representing degree of turbulence and active disposition to have the school innovate showed null effects at all stages of the process. These findings do not seem to support Sieber's (1968) contention that schools are very vulnerable to environmental impingements, at least as they relate to innovation and change. These findings could be interpreted as providing some support for Gittell and Hollander's (1968) finding that most schools successfully prevent environmental penetration of their boundaries.

The finding that characteristics of organizational members showed no impact on the extent of adoption of TEC, we feel is a function of a major weakness in our data -- the lack of good measures of teacher characteristics. The few we had failed to make it through our data reduction procedures. As noted earlier, very few principals made the final decision to adopt, or not adopt, TEC -- the decision typically resided with the teachers individually. We therefore feel had we had appropriate measures of teachers' characteristics, they would have shown a strong impact on the extent of adoption of TEC.

This point also raises another consideration, one regarding the role of the principal in the process of adopting TEC. Liebert (1973, p. 57) poses the question, "What role did these principals play in the decision to adopt or not to adopt?" And he answers, "By their own reports, they played a minor role." There is no question about the fact that very few principals made the final decision to adopt, or not adopt TEC. Our analyses, however, lead us to believe that principals played a rather critical role in making it possible or viable to adopt TEC via their activities in the Diagnosis, Initiation and Introduction stages of the process. Indirectly they therefore probably had a strong impact on the adopt/not-adopt decision made by teachers at Stage 5.

In summary, we would like to present the full conceptual model with which we began, revised to reflect the findings of this study. Table 5 on the following page presents the model again, this time with the cells filled with plus signs (where we found impacts), zeroes (where we found no impacts), and question marks (for aspects of the

Table 6 Revised Full Conceptual Model of the Process of Organizational Change Showing Areas of Impact, Null Effects, and Areas Not Addressed in This Study

STAGES IN KAPLAN'S MODEL OF THE PROCESS OF ORGANIZATIONAL CHANGE	INFLUENCING FACTORS											
	ATTRIBUTES OF THE INNOVATION	STRATEGIES OF INTRODUCTION	CHARACTERISTICS OF [illegible] MEMBERS	STRUCTURAL PROPERTIES OF ORGANIZATION	CHARACTERISTICS OF ORGANIZATIONAL ENVIRONMENT	CHARACTERISTICS OF THROUGHPUT (PUPILS)	RESULTS OF STAGE 1	RESULTS OF STAGE 2	RESULTS OF STAGE 3	RESULTS OF STAGE 4	RESULTS OF STAGE 5	RESULTS OF STAGE 6
STAGE 1 Existence of a Problem Condition			0	+	+	+						
STAGE 2 Diagnosis	?	?	+	0	+	0	0					
STAGE 3 Initiation	?	?	+	+	+	0	+	+				
STAGE 4 Introduction	?	?	+	0	0	0	+	0	+			
STAGE 5 Transition	?	?	0	+	0	0	0	+	+	0		
STAGE 6 Routinization	?	?	?	?	?	?	?	?	?	?	?	
STAGE 7 Stabilization	?	?	?	?	?	?	?	?	?	?	?	?

+ = indicates factor had impact at that stage
0 = indicates factor had no impact at that stage
? = indicates factor and/or stage not addressed in this study

model we were not able to address). We have already raised numerous questions that indicate areas included in our analyses needing further investigation. Obviously, in addition to the questions already raised, each question mark in Table 5.1 indicates a need for further research.

We have examined the utility of a model of organizational change and innovation that incorporates both a sequential multi-stage paradigm of the change process and a broad array of factors previously found to affect the process in some way. We found both aspects of our model to be useful in examining the phenomenon of organizational change. The sequential nature of the multi-stage change model we adapted from Kaplan's work seems to reflect the basics of reality, although we feel that some of the stages may overlap (i.e., may take place more or less simultaneously). By combining the multifaceted broad categories of influencing factors with the multi-stage sequential model it became clear that different sets of factors are most important at the various stages in the process of organizational change. We recommend that future research in this area use the model developed here in order to elaborate the details of the broad conceptualization we have presented. Since our model was tested using data collected on a rather unique type of complex organization (elementary schools), some rather major modifications may be necessary in study of other types of complex organizations.

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